Rockwell GPS

NavStrike™
Rockwell's New Generation Receiver for
Precision Guided Munitions

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- ■ **Background**

- ■ **Rockwell SAASM**

- ■ **Rockwell NavStrike™ Product**

- ■ **Summary**

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■ Rockwell Collins is the Leading Producer of GPS Receivers for Munitions

ATACMS (Missile)	**Tomahawk Block III**
AGM-130	**SLAM**
M270-A1 (Launcher)	**Standard Missile 3**
JDAM (2000 lb. bomb)	**ERGM Demo**
SLAM-ER	**CMTD** (155mm Artillery)
LCCM	**CMATD** (5" Artillery)
CALCM	

■ GPS to Meet Wide Range of Armament Needs

● All classes of competent munitions needs met by GPS ie... Missiles, Bombs, Rockets, Artillery and Mortars

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■ Two major munitions application types identified:

- Precision Guided Munitions (PGM)

  ➢ *Missiles, Rockets, and Bombs*

- Competent Artillery and Mortars

  ➢ *Army 155mm and Navy 5"*

  ➢ *Mortars*

■ NavStrike™ is Rockwell's Next Generation PGM Receiver

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■ Selective Availability / Anti-Spoofing (SA/A-S)

- ● SA/A-S Denies Full GPS Accuracy to Unauthorized Users

- ● Present GPS Receivers Use PPS-SM and AOC Chips to Remove Selective Availability and to Track Y-Code

- ● Classified (Red) Keys Used

- ● SAASM Replaces PPS-SM

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- What is SAASM (Selective Availability & Anti-Spoofing Module) ?
  - The Next Generation Security Architecture for GPS

- Why SAASM?
  - Joint Chiefs of Staff SAASM Instruction Released 15 November 1998
    - *1 October 2002: Procurements of non-SAASM GPS user equipment are disallowed*
  - Provides Improved Security
  - SAASM Advantages
    - *Distribution of Red Keys is a Logistical Nightmare*
      - SAASM Supports use of Unclassified (black) Keys
    - *SAASM Supports Over-the-Air-Rekeying (OTAR)*

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■ Multichip Module (MCM) that contains KDP, CINCO, Rockwell ASICS including Nighthawk, Stringray, and ACE

- Government Furnished Key Data Processor (KDP) Stores all Crypto Keys and Performs Security Related Functions
- Nighthawk DSP Supports 12-Channel All-in-View Operation
- Stingray Performs Memory Management and Control Memory Partitioning for the GPS Security Boundary
- Acquisition Correlator Engine (ACE) Provides 1024 Complex Correlators for Fast Acquisitions
  - ➢ *Supports Fast DY Acquisitions*
  - ➢ *Supports Fast Cold Starts*

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■ MCM is Protected by NSA Approved Tamper-Resistant Coating

   ● Rockwell is an NSA Approved Tamper-Resistant Production Facility

■ GPS-JPO has Approved Rockwell Proprietary Approach that Provides Unclassified Pseudorange and Deltarange Measurement Data Even when Receiver is Keyed

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■ NavStrike™ Developed via:

- ● Rockwell IR&D

- ● GPS-JPO Program Research and Development Announcement (PRDA)

  - ➢ *Development of standardized embedded GPS Receiver Application Modules (GRAM) to promote interoperability, compatibility and commonality among military equipment, subsystems and systems*

  - ➢ *GRAM is required to be integrated with SAASM*

  - ➢ *Types of applications under PRDA include PGM, VME, SEM-E, PCMCIA, Handheld/Ground, Projectile*

  - ➢ *PGM-GRAM standards are being finalized and implementation is underway*

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■ NavStrike™ Developed via (Cont.):

- Dynamics Research Corporation (DRC)
  - *DRC teamed with Rockwell to develop a GRAM-SAASM-VME using NavStrike™*

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■ Physical Characteristics

- Small Form Factor (3.0 x 3.5 in)

- Interfaces
  - *High Speed Serial Interfaces (RS-422/232/CMOS)*
  - *Crypto Interface (DS-101/DS-102), Serial Interface*
  - *Timing Interface 1PPS/HaveQuick/TimeMark*

- Two External Connectors
  - *60 pin module connector*
  - *RF connector*

- Weight
  - *< 0.5 lb including shield and mounting brackets*

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■ Features

- 12 Channel All-In-View Tracking and Navigation Improves Tracking Performance and Accuracy

- Fast DY and Cold Start Acquisitions (ACE technology)

- Dual Frequency L1/L2 Tracking

- Stand Alone GPS or INS Aided Operation

- High Rate INS Aiding

- Pseudorange/Deltarange & PVT Output messages

- High AJ (self contained)

- PGM-GRAM Standard Interface Message Set

- Black Key capable

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■ Features (Cont.)

- ● Provides Ability to Calibrate Frequency Standard and Store Results in Flash Memory
  - ➢ *Performs Satellite Acquisitions After up to 20 Years*
- ● Antenna Masking
- ● Satellite selection and exclusion
- ● Attitude and Lever Arm processing
- ● On board Low Power Time Source
- ● Field Reprogrammable
- ● Configurable Serial Ports
  - ➢ *Selectable I/O baud rates and parity*
- ● User Defined Acquisition Cases
  - ➢ Time, position, and velocity uncertainty
  - ➢ Code type for acquisition

Performance

- *Jam Resistance*
  - ➤ *70 dB J/S (CW) (aided state 3)*
  - ➤ *42 dB J/S (unaided)*

- *Initial Acquisitions*
  - ➤ *< 8 Sec DY*

Environmental

- *-54 deg C to +85 deg C*

- *20.0 G RMS vibration*

- *40.0 G Launch shock*

- *386 G Pyrotechnic shock*

- *MIL-STD-461D EMIC*

- *SAASM is Hermetically Sealed*

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■ In Jan '00 the GPS-JPO granted Security Approval to Rockwell to Deliver NavStrike™ Engineering Units to Domestic Customers

■ NavStrike™ is Scheduled for Baseline Design Review (BDR) with the GPS-JPO in mid-March

  ● BDR approval is required prior to production PPS receivers

■ Fully Qualified NavStrike™ Receivers Scheduled for availability 4Q / CY'00

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■ Rockwell is Continuously Performing Tech Insertions for Next Generation SAASM to:

- Reduce Size
- Reduce Cost
- Increase Performance
- Increase Reliability

■ SAASM Just one Piece of the GPS Puzzle

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